tude, and which, therefore, if it had been used in the computation would not have altered the result.

I have also received a report of observations made by Mr. George F. von Ostermann and Mr. H. G. McKim, at Spalding, Prince George County, Md., which harmonizes with the orbit as given above.

THE RELATION OF THE MOVEMENTS OF THE HIGH CLOUDS TO CYCLONES IN THE WEST INDIES.

By JOHN T. QUIN. Dated St. Croix, Danish West Indies, October 30, 1907.

The following is offered in continuation of the article by the present writer, which was published under the above title in the MONTHLY WEATHER REVIEW for May, 1907.[1]

In that article it was shown that Father Viñes's theory, that, at the cirrus cloud level, the current from the vortex of a cyclone spreads out in "a completely divergent radial direction", holds good only at comparatively short distances (say between 100 and 200 miles); but that when the distance is greater the outflowing current, as shown by cirrus clouds, appears to come toward the observer from a point more and more removed to the right as the distance increases. In other words, the vortex, when at a great distance, is situated not in the direction of the radiating point of the high clouds, but in a direction to the left of that point, the amount of the divergence depending on the distance of the vortex from the observer.

It seems advisable to make a few remarks as a sort of supplement to the above-mentioned article, by way of clearing up some points that were then left in a somewhat uncertain position.

(1) In the description of the movements of the high clouds over St. Croix during the passage of the Cuban cyclone of October 17, 1906 (page 218), it is stated that, "On the 19th they were moving from the north; on the 20th at 7 a. m. from north-northeast; *on the same day at 5 p. m. again from north;* and on the 21st from east-northeast".

The part of the above statement which is now put in italics is so put to call attention to the remarkable fact that the radiating point of the high clouds, after having continued its forward movement from north as far round as north-northeast, then fell back again to north. This was left without comment in the article, but was regarded by the writer as a very weak point in the evidence, since it seemed from this irregular motion that these high clouds were not under a fixt law, but were governed by a kind of waywardness in their movements. So far, however, from being a weak point, it turned out, as will presently appear, to be one of the strongest that could possibly present itself. This was discovered when the writer, desiring to find out whether this hurricane, on leaving Florida, went forward over the Atlantic, as the movements of the high clouds here seemed to indicate, or whether it went off to the northwest, as stated in a telegram received here, lookt up the MONTHLY WEATHER REVIEW for October, 1906, and found there (page 479), in regard to this great storm, the following:

> On the morning of the 17th, reports indicated the presence south of western Cuba of a well-defined cyclonic disturbance, and at 11 a. m. of that date storm warnings were ordered on the east Gulf, Florida, and south Atlantic coasts, and the following was telegraphed to Atlantic and Gulf ports, and to Havana, Cuba: "* * * Disturbance apparently approaching western Cuba from the Caribbean Sea. Unsafe for vessels next few days off western Cuba, Florida, and south Atlantic coasts."
>
> The center of the storm past near and east of Havana at 11:30 p. m. of the 17th, with minimum barometer at Havana, 28.86 inches, and by the morning of the 18th had reached a position near and to the eastward of Key West, where at 3 a. m. a minimum barometric reading of 29.30 inches was registered. Moving thence northeastward to a point about opposite the South Carolina coast, the center recurved to the westward, *and was then forced southward over the Florida Peninsula* by an area of high barometer that covered the north Atlantic coast districts.

[1] Vol. XXXV, p. 215–218.

The italics are the present writer's and are used to call attention to the striking fact that the cyclone center, after proceeding toward the northeast, paused and *went back to Florida.* This is just what the high clouds said it did. Precisely at the time that their action lookt capricious they were closely following the law that appears to govern their movements. The cyclone advanced from Florida northeastward out into the Atlantic, and the radiating point of the high clouds at St. Croix answered by an advance from north to north-northeast; but now the cyclone, checked in its course, returns to Florida, and the radiating point of the high clouds at St. Croix thereupon falls back to the north. If we could fix the exact hours when the changes took place, both for the cyclone center and for the clouds, we should be able to tell just how long it took for the high currents to reach St. Croix from the vortex of the storm.

The notice of the storm from which the quotation is taken does not say what became of the cyclone after its return to Florida. According to the story of the high clouds, as told at St. Croix, it started once more on its movement over the Atlantic, and on this second occasion continued on its course for several days. If the high clouds were not on their trial, we might, after their accurate report about the recessional movement, take their word for the rest of the story; but as they are on their trial, all points must be supported by independent evidence. And as there is no evidence accessible, the latter part of the story must still remain unconfirmed.

(2) In the article in the May number it was remarked in connection with the above storm—

> If it proves to be likely that there was a connection between the cirrus clouds and the cyclone in the above last-named case, then this connection existed at a distance of about 1,200 miles, the distance between St. Croix and Havana. That would be a very striking fact, if we could establish it.

Now it will perhaps be admitted that the remarkable agreement between the unusual movements of the cyclone center and the unusual movements of the high clouds, as above pointed out, amounts, when taken with the other facts, almost to a proof that the connection in question did exist when the cyclone left Florida and returned thereto. But the distance of the vortex from St. Croix must then have been about 1,100 miles, or nearly as great as the distance to Havana. Hence there seems to be strong ground for believing that the influence on the upper air of the movements taking place in the vortex of a cyclone extends even to such a great distance as 1,200 miles.

(3) In the same article, reference was made to some figures given by Mr. Page, in an earlier number of the MONTHLY WEATHER REVIEW, concerning the direction of cirrus cloud movements at Havana, but as the said earlier number was not then at hand the figures could not be quoted. They have since been found in the MONTHLY WEATHER REVIEW for July, 1904 (page 311). They represent Mr. Page's analysis of the frequency of upper cloud motions during hurricane months, as observed at Belen College, Havana, and are as follows:

Clouds.	Number of observations.	Percentage of frequency of movement from—			
		NE.	SE.	SW.	NW.
Upper	645	23	8	39	30

From this it will be seen that 69 per cent of the movements noted were from westerly points, while only 31 per cent, not quite one-third of the whole, were from easterly points, so that it is hard to see how Father Viñes could have arrived at the conclusion that there is a "superior general current which at that time of the year (the hurricane season) comes from the eastern quarter".

There seems to the present writer to be no evidence whatever for such a conclusion; but the truth appears to be that the normal direction of the upper current during the hurricane season, as at all other times, is from a westerly point, and that any deviation from this rule is to be lookt upon not as a mere freak, or accident, but as a phenomenon to be traced to a definite cause—that cause being, at all events in some cases, the presence and progress of a cyclonic depression.

Since writing the article to which the above remarks are offered as supplementary, we have had in the West Indies another hurricane season, and, altho no hurricane has occurred among the islands, we have seen here in St. Croix, during the season, no less than eight deviations of the high clouds from their usual course. Some of these were thru south round to the northeast quadrant, indicating perhaps, distant storms on the Atlantic, passing to the north of these Danish Islands; while others were thru north round to the above-named quadrant and indicated, it may be, storms originating in the Caribbean and passing northward.

So far there is very little evidence to connect any of the deviations, or "excursions", as we may perhaps call them, with cyclonic depressions.

The last three occurred in the latter part of September and in October; each was attended by a small fall in the barometer, and each October movement gave a little rain to St. Croix, on the 10th and 20th, respectively.

These three "excursions" are dealt with in the local newspaper (St. Croix Avis) of October 30 in the following article by the writer, which may serve to close the present paper:

Those of our readers who take an interest in weather studies will remember that in the last number of this paper we spoke of three excursions which the point of origin or radiating point of the high clouds had made from its normal position about west into the northeast quadrant, one in September and two in October. They were as follows:

1. The first excursion—commencing from southwest by west, going round to northeast, and lasting from the 23d to the 29th of September.

2. The second excursion—commencing from south-southwest on the 8th (with a temporary excursion to south-southeast) and going round to northeast by north, and lasting from the 8th to the 18th of October.

3. The third excursion—commencing from west-southwest and going round to northeast by north, and lasting from the 19th to the 25th of October.

From earlier comparisons of high cloud observations with the known and mapped out tracks of certain cyclones, we believe that each of these three excursions means the origin of a cyclone in the Caribbean, its subsequent passage from that sea to the Atlantic, and its farther movement in a northerly direction over that ocean. Sometimes there are excursions in the other direction, namely, round through south and east, but we need not consider them here.

But how are we to know that these swings of the radiating point of the high clouds through north round to northeast have the meaning ascribed to them. Evidently we can only come at it by finding out whether there were any actual cyclones answering to the theoretical description. In each of the three cases now under consideration the movement appears to have been of no great importance before or at the time of leaving the Caribbean, for we have heard of no storms among the islands to the west of us; if there were any, they were not of sufficient force to be destructive, or at all events not to any degree that was thought worth reporting. They entered the Atlantic quietly, but it remains to enquire whether they were developed there. From the duration of the high cloud excursions, and the radiating point going round as far as northeast, we should infer that in each case considerable energy was developed as the cyclone traveled northward, but what evidence is there to show that such was the fact. About the third one we have as yet no confirmatory tidings; but it is now (on the 29th) only four days since the influence of this movement on the high clouds here ceased, so the case may fairly claim a little delay. We deal therefore with the evidence for the *first* and *second* excursions.

1. Evidence bearing on the first excursion. In the Avis of Saturday last (26th instant) we adduced the case of the schooner *Carrie E. Bucknam*, which on the 1st of October, in latitude 37° 44′, with a gale blowing from northwest, appears to have had a cyclone center to the northeast of her. To-day we are able to bring what looks like fairly good evidence that a powerful cyclone passed up the Atlantic during the high cloud excursion which we now have under consideration. The New York Herald of the 1st of October gives some account of a storm which endangered the Atlantic fleet at Cape Cod on the night of the 29th of September. It was a gale from the east. That it was part of a cyclone is evident from the reference to the fact that storm signals had been hoisted; and it seems likely that the cyclone did not come off the continent, but up the Atlantic, for a short paragraph in the same paper speaks of the fears of the Navy Department for the safety of the seagoing tug *Lebanon* and the *Gloucester*, which were on their way from Pensacola, Fla., to the Navy Yard at Portsmouth, N. H., where the *Gloucester* was to be repaired.

Cape Cod is in latitude 42°. In the September cyclone of last year the storm center had reached about latitude 32° when its hold on the high clouds here was given up. Cape Cod is much (say nearly 700 miles) farther away; but then we must remember that the storm center was not at Cape Cod, but some distance south of it, and that it may have been moving very fast toward the north.

From all which it appears that, while the evidence looks very promising, we can not make proper comparisons or make sure of the case till we get further details, which may possibly come to hand later.

2. Evidence in regard to the second excursion (the first in October). In this case we have as yet only one piece of evidence, namely the experience of the *Guiana* on her recent trip from New York. The steamer left New York at 6 p. m. on Saturday the 12th instant to come south; about the same time, or perhaps on the previous day, the cyclone left the Caribbean to go north. If they should pass each other it would not be surprising. Accordingly, Tuesday night was rough. A gentleman who was one of her passengers informed us that he came on deck very early on Wednesday morning and observed three things, a strong wind from southwest, a considerable sea rolling in from southeast, and a dense bank of clouds toward the northeast. The barometer had dropped to 29.60 and the steamer had been slowed down a little during the night. We can see at once that a cyclone with its center some distance to the west of the steamer (100 or 200 miles, perhaps) had passed during the night. When in the morning the wind was southwest, the center was away to the northwest. The sea which came rolling in from the southeast had no doubt been raised by the wind in the cyclone's northeast quadrant, and the clouds to the northeast had been carried there by the southwest wind. As the steamer came south the conditions became rapidly better till she was once more sailing in fine weather.

Thus it will be seen that there is some evidence to confirm the theoretical views about excursions numbers one and two, and we may hope to get more later. For any confirmation in regard to excursion number three we must, as already intimated, wait a little longer.

A METHOD OF PRESERVING RAINFALL.

By J. CECIL ALTER, Assistant Observer. Dated Salt Lake City, Utah, November 4, 1907.

On April 16, 1907, I placed 0.20 inch of pure olive oil on 0.20 inch of water in the regulation Weather Bureau pattern 8-inch rain gage—with the funnel receiver, but without the inner tube—and exposed the gage in the regular support alongside the tipping-bucket gage. On November 3, 1907, I measured the contents of the gage, which amounted to 7.77 inches after deducting for the oil and the original water supporting the oil. The records in the office, obtained from the tipping-bucket gage during the same period of time, indicated a total precipitation of 8.03 inches—a discrepancy of 0.26 inch, or about 3 per cent, which was probably caused in part by evaporation; for after light showers, which are so frequent here, many tiny drops of water have been observed to lie sustained on the oil for a considerable length of time before sinking.

This experiment has been carefully made, and the results may be useful in solving the problem of obtaining records of precipitation in the unpopulated regions of the West.

RECENT ADDITIONS TO THE WEATHER BUREAU LIBRARY.

H. H. KIMBALL, Librarian.

The following titles have been selected from among the books recently received, as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies. Most of them can be loaned for a limited time to officials and employees who make application for them.

Baden. Zentralbureau für Meteorologie und Hydrographie.

Deutsches meteorologisches Jahrbuch. 1906. Karlsruhe. 1907. 75 p. f°.

Jahres-Bericht... 1906. Karlsruhe. 1907. 116 p. f°.

Birkeland, B. J.

Neue Feuchtigkeits-Tafeln für das Psychrometer unter dem Gefrierpunkt. Christiania. 1907. 33 p. 4°.